

said organic group(I) to form a secondary amino compound, in order to produce a product(A) having said hydrolyzable group directly bonded to 1 to 10 silicon atoms and having less than two secondary amino groups in one molecule;

(2) reacting a polyisocyanate compound (compound(d)), with a compound selected from the group consisting of: a polyol compound (compound(c)), a polythiol compound (compound(c-1)), and a compound (product(C)) having an average molecular weight of 100-25000 and having at least 0.2 terminal secondary amino groups in one molecule, in order to produce a (thio)urethane pre-polymer (product(B)) having a terminal isocyanate group in an amount of 4 % or less by weight of said product(B), wherein said product(C) is obtained by reacting a compound(e) having an organic group(II) selected from the group consisting of amino and acryloyl groups, with a compound(f) having an average molecular weight of 100-25000 and being capable of reacting with said organic group(II) to form a secondary amine compound; and

(3) reacting said product(A) with said product(B) in the proportions of at least 0.5 equivalent of said product(A) per free isocyanate group of said product(B).

A
I
47 SUR C

The process for the preparation of urethane resins according to claim 46, wherein said compound(a) is a compound(a-1) having one primary amino group as said organic group(I), and wherein said compound(b) is a compound(i) selected from the group consisting of an α , β -unsaturated carbonyl compound and α , β -unsaturated nitrile compound.

48. The process for the preparation of urethane resins according to claim 46, wherein said compound(a) is a compound(a-2), said compound(b) is selected from the group consisting of a compound(i), compound(l) and compound(m), wherein said compound(a-2) has at least two primary or secondary amino groups or has at least one primary amino group and secondary amino group as said organic group(I), wherein said compound(i) is selected from the group consisting of an α , β -unsaturated carbonyl compound and α , β -unsaturated nitrile compound, wherein said compound(l) has less than two isocyanate groups and is obtained by reacting a compound(j) having at least two isocyanate groups

with a compound(k) having one to two active hydrogens being reactive with an isocyanate group, and wherein, said compound(m) is a monoisocyanate compound.

49. The process for the preparation of urethane resins according to claim 48, said compound(k) being selected from the group consisting of a monoalcohol, monoprimry amine, monosecondary amine and monothiol.

50. The process for the preparation of urethane resins accoding to claim 46, said compound(a) being a compound(a-3) having an acryloyl group as said organic group(I), said compound(b) selected from the group consisting of: a monoprimry amine compound (compound(n)), and a compound(o) having at least two primary or secondary amino groups or having at least one primary amino and secondary amino group.

51. A process for the preparation of urethane resins comprising the steps of:

(1) reacting a compound(a-3) having a hydrolysable group selected from the group consisting of alkoxy and acetoxy groups directly bonded to 1 to 10 silicon atoms and having an acryloyl group, with a compound selected from the group consisting of: a mono primary amine compound (compound(n)), and a compound(o) having at least two primary or secondary amino groups or having at least one primary amino and secondary amino group, and further reacting with a compound selected from the group consisting of: a compound(i), a compound(l) and a compound(m), in order to produce a product(D) which has a hydrolyzable group directly bonded to 1 to 10 silicon atoms and has less than two secondary amino groups in one molecule, wherein, said compound(i) is selected from the group consisting of an α , β -unsaturated carbonyl compound and α , β -unsaturated nitrile compound, wherein, said compound(l) has less than two isocyanate groups and is obtained by reacting a compound(j) having at least two isocyanate groups with a compound(k) having one to two active hydrogens being reactive with an isocyanate group in the molecule, and wherein, said compound(m) is a monoisocyanate compound; and

(2) reacting said product(D), with a (thio)urethane pre-polymer (product(B)) having a terminal isocyanate group in an amount of 4 % or less by weight of said

product(B), in proportions of at least 0.5 equivalent of said product(D) per free isocyanate group of said product(B), wherein said product(B) is obtained by reacting a polyisocyanate compound (compound(d)), with a compound which is selected from the group consisting of: a polyol compound (compound(c)), a polythiol compound (compound(c-1)), and a compound (product(C)) having an average molecular weight of 100-25000 and having at least 0.2 terminal secondary amino groups in one molecule, said product(C) obtained by reacting a compound(e) having an organic group(II) selected from the group consisting of amino and acryloyl groups, with a compound(f) being capable of reacting with said organic group(II) to form a secondary amine compound.

52. A process for the preparation of urethane resins comprising the steps of

(1) polymerizing at least one selected from the group consisting of: a (meta)acryloyl group-containing monomer, a hydroxy group-containing (meta)acrylate, and a silicon compound (compound(y)) which has a hydrolyzable group being selected from the group consisting of alkoxy and acetoxy groups directly bonded to 1 to 10 silicon atoms and has a (meta)acryloyl group, in the presence of a compound selected from the group consisting of: a polyol compound (compound(c)), a polythiol compound (compound(c-1)), and a product(C) having an average molecular weight of 100 to 25000 and having at least 0.2 terminal secondary amino groups in one molecule, in order to obtain a polymer (product(L)), wherein said product(C) is obtained by reacting a compound(e) having an organic group(II) selected from the group consisting of amino and acryloyl groups, with a compound(f) being capable of reacting with said organic group(II) to form a secondary amine compound;

(2) reacting said product(L), with a polyisocyanate compound (compound(d)), in order to produce an urethane pre-polymer (product(M)) having a terminal isocyanate group in an amount of 4 % or less by weight of the molecule; and

(3) reacting said compound(M) with at least one compound or product selected from the group consisting of a product(A), product(D), compound(a-1), compound(a-2), compound(k) and compound(o), in proportions of said at least one compound or product of 0.5 equivalent or more per free isocyanate of said compound (M), wherein, said

product(A) has a hydrolysable group selected from the group consisting of alkoxy and acetoxy groups directly bonded to 1 to 10 silicon atoms, has less than two secondary amino groups and is obtained by reacting a compound(a) with a compound(b), said compound(a) having said hydrolyzable group directly bonded to 1 to 10 silicon atoms and having an organic group(I) selected from the group consisting of primary amino, secondary amino and acryloyl groups, said compound(b) being capable of reacting with said organic group(I) to form a secondary amino compound, wherein, said product(D) has said hydrolyzable group directly bonded to 1 to 10 silicon atoms, has less than two secondary amino groups in one molecule and is obtained by reacting a compound(a-3) with a compound(n) or compound(o) and further reacting with a compound selected from the group consisting of compound(i), compound(l) and compound(m), said compound(a-3) which has a hydrolysable group selected from the group consisting of alkoxy and acetoxy groups directly bonded to 1 to 10 silicon atoms and has an acryloyl group, said compound(n) which is a mono primary amine compound, said compound(o) which has at least two primary or secondary amino groups or having at least one primary amino group and secondary amino group, said compound(i) which is selected from the group consisting of an α , β -unsaturated carbonyl compound and an α , β -unsaturated nitrile compound, said compound(l) which has less than two isocyanate groups and is obtained by reacting a compound(j) having at least two isocyanate groups with a compound(k) having one to two active hydrogens being reactive with an isocyanate group, said compound(m) which is a monoisocyanate compound, wherein, said compound(a-1) has a hydrolysable group selected from the group consisting of alkoxy and acetoxy groups directly bonded to 1 to 10 silicon atoms and has a primary amino group, and wherein, said compound (a-2) has a hydrolysable group selected from the group consisting of alkoxy and acetoxy groups directly bonded to 1 to 10 silicon atoms and has at least two primary or secondary amino groups or at least one primary amino and secondary amino group.

53. A process for the preparation of urethane resins comprising the steps of reacting at least one product selected from the group consisting of a product(B) and product(M), with a compound or product selected from the group consisting of a product(D),

compound(a-1), compound(a-2), compound(k) and compound(o), in proportions of a compound(A) and said compound or product of 0.5 equivalent or more per free isocyanate of said at least one product, wherein, said product(B) is a (thio)urethane pre-polymer (product(B)) having a terminal isocyanate group in an amount of 4 % or less by weight of said product(B) and is obtained by reacting a polyisocyanate compound (compound(d)) with a compound which is selected from the group consisting of a polyol compound (compound(c)), a polythiol compound (compound(c-1)) and a compound (product(C)) having an average molecular weight of 100-25000 and having at least 0.2 terminal secondary amino groups in one molecule, said product(C) is obtained by reacting a compound(e) having an organic group(II) selected from the group consisting of amino and acryloyl groups and having an average molecular weight of 100-25000 with a compound(f) being capable of reacting with said organic group(II) to form a secondary amine compound, wherein, said product(M) is an (thio)urethane pre-polymer having a terminal isocyanate group in an amount of 4 % or less by weight of the molecule and is obtained by reacting a product(L) with said compound(d), said product(L) being obtained by polymerizing at least one selected from the group consisting of: a (meta)acryloyl group-containing monomer, a hydroxy group-containing (meta)acrylate, and a silicon compound (compound(y)), said compound(y) having a hydrolyzable group which is selected from the group consisting of an alkoxy and acetoxy group directly bonded to 1 to 10 silicon atoms and having a (meta)acryloyl group, in the presence of a compound selected from the group consisting of: said compound(c), said compound(c-1) and said product(C), wherein, said product(D) has a hydrolyzable group directly bonded to 1 to 10 silicon atoms, has less than two secondary amino groups in one molecule and is obtained by reacting a compound(a-3) with a compound selected from the group consisting of a compound(n) and compound(o), and further reacting at least one selected from the group consisting of a compound(i), a comopound(l) and a compound(m), said comopound(a-3) having an acryloyl group and having at least one selected from the group consisting of alkoxy and acetoxy groups, said compound(n) being a monoprimary amine compound, said compound(o) having at least two primary or secondary amino groups or having at least one primary amino group and secondary amino group, said compound(i) being

selected from the group consisting of an α , β -unsaturated carbonyl compound and an α , β -unsaturated nitrile compound, said compound(l) having less than two isocyanate groups and being obtained by reacting a compound(j) having at least two isocyanate groups with a compound(k) having one to two active hydrogens being reactive with an isocyanate group and said compound(m) being a monoisocyanate compound, wherein, said compound(a-1) has a hydrolysable group selected from the group consisting of alkoxy and acetoxy groups directly bonded to 1 to 10 silicon atoms and has a primary amino group, wherein, said compound (a-2) has a hydrolysable group selected from the group consisting of alkoxy and acetoxy groups directly bonded to 1 to 10 silicon atoms and has at least two primary or secondary amino groups or at least one primary amino and secondary amino group and, wherein, said product(A) which has a hydrolysable group directly bonded to 1 to 10 silicon atoms of said product(A), has two or less secondary amino groups and is obtained by reacting a compound(a) having an organic group(I) which is selected from the group consisting of primary amino, secondary amino and acryloyl groups and having a hydrolyzable group which is selected from the group consisting of alkoxy and acetoxy groups directly bonded to 1 to 10 silicon atoms, with a compound(b) being capable of reacting with said organic group(I) to form a secondary amino compound.

54. The process for the preparation of urethane resins comprising the steps of:

(1) reacting a compound (compound(ab)) having at least one active hydrogen being reactive with an isocyanate group in one molecule and having 1 to 10 silicon atoms directly bonded to a hydrolyzable group selected from alkoxy and acetoxy groups, with a compound selected from the group consisting of: a compound(l) obtained by reacting a compound(j) having at least two isocyanate groups with a compound(k) having one to two active hydrogens being reactive with an isocyanate group, a monoisocyanate compound (compound(m)), and a compound(i) selected from the group consisting of an α , β -unsaturated carbonyl compound and an α , β -unsaturated nitrile compound, in order to produce a product(N) having less than two active hydrogens being reactive with an isocyanate group in one molecule;

(2) reacting said product(N), with a compound selected from the group consisting of said compound(j) and a compound(bb) having at least 1.1 isocyanate groups in one molecule, in order to obtain a silicon compound (product(O)) having less than two isocyanate groups and having a hydrolysable group selected from alkoxy and acetoxy groups directly bonded to at least one silicon atom, wherein said compound(bb) is obtained by reacting said compound(j) with said compound(k);

(3) reacting said product(O), with a compound or product selected from the group consisting of: a polyol compound (compound(c)), a polythiol compound (compound(c-1)), a compound(cd) having at least one selected from the group consisting of a primary and secondary amino group, a product(C) having an average molecular weight of 100-25000 and having at least 0.2 terminal secondary amino groups in one molecule, and a product(L) being a polymer, wherein said product(C) is obtained by reacting a compound(e) having an organic group(II) selected from the group consisting of amino and acryloyl groups and having an average molecular weight of 100-25000, with a compound(f) being capable of reacting with said organic group(II) to form a secondary amine compound, wherein said product (L) is obtained by polymerizing at least one selected from the group consisting of: a (meta)acryloyl group-containing monomer, a hydroxy group-containing (meta)acrylate, and a silicon compound (compound(y)), said compound(y) having a hydrolyzable group which is selected from the group consisting of an alkoxy and acetoxy group directly bonded to 1 to 10 silicon atoms and having a (meta)acryloyl group, in the presence of a compound selected from the group consisting of: said compound(c), said compound(c-1) and said product(C).

55. The process for the preparation of urethane resins according to claim 54, wherein said compound(ab) has further at least one selected from the group consisting of primary amino, secondary amino, mercapto and hydroxy groups, and wherein said compound(k) is selected from the group consisting of monoalcohol, monoprimary amine, monosecondary amine and monothiol compound.

56. The process for the preparation of urethane resins comprising the steps of:

(1) reacting a compound(eb) with a compound(fb), or after reacting said compound(eb) with said compound(fb), further reacting with a compound selected from the group consisting of a compound(l), compound(m) and compound(i), in order to obtain a silicon compound (product(R)) having a hydrolyzable group directly bonded to at least one silicon atom and having less than two secondary amino groups, wherein, said compound(eb) is a silicon compound having at least one acryloyl group (organic group(VIII)) and having at least one hydrolyzable group selected from the group consisting of alkoxy and acetoxy groups bonded to at least one silicon atom, wherein, said compound(fb) is capable of reacting with said organic group(VIII) to form a secondary amino compound, wherein, said compound(l) has less than two isocyanate groups and is obtained by reacting a compound(j) having at least two isocyanate groups with a compound(k) having one to two active hydrogens being reactive with an isocyanate group, wherein, said compound(m) is a monoisocyanate compound, and wherein, said compound(i) is selected from the group consisting of an α , β -unsaturated carbonyl compound and an α , β -unsaturated nitrile compound;

(2) reacting said product(R), with said compound(j) or a compound(bb) having at least 1.1 isocyanate groups in one molecule and being obtained by reacting said compound(j) with said compound(k), in order to produce a silicon compound (product(S)) having at least one hydrolyzable group directly bonded to at least one silicon atom and having less than two isocyanate groups;

(3) reacting said product(S), with at least one selected from the group consisting of: a polyol compound (compound(c)), a polythiol compound(compound(c-1)), a compound(cb), a product(C), and a product(L), wherein, said compound(cb) has at least one primary amino or secondary amino group in one molecule, wherein, said product(C) has an average molecular weight of 100 to 25000, has at least 0.2 terminal secondary amino groups and is obtained by reacting a compound(e) having a organic group(II) selected from the group consisting of amino and acryloyl groups and having an average molecular weight of 100-25000, with a compound(f) being capable of reacting with said organic group(II) to form a secondary amine compound, and wherein, said product(L) is

produced by polymerizing at least one selected from the group consisting of: a (meta)acryloyl group-containing monomer, a hydroxy group-containing (meta)acrylate, and a silicon compound (compound(y)) having a hydrolysable group selected from alkoxy and acetoxy directly bonded to 1 to 10 silicon atoms and having a (meta)acryloyl group, in the presence of a compound selected from the group consisting of said compound(c), said compound(c-1) and said product(C).

57. The process for the preparation of the urethane resins according to claim 56, wherein said compound(eb) is a compound having at least one acryloyl group as said organic group(VIII), the said compound(fb) is a compound having at least one selected from the group consisting of a primary amino and secondary amino group.

58. A process for the preparation of urethane resins comprising the steps of:

(1) reacting a compound(ib), with a compound selected from the group consisting of a compound(j) and compound(bb) , in order to produce a product(V) having less than two isocyanate groups and having at least one hydrolysable group directly bonded to a silicon atom, wherein, said compound(ib) has a hydrolysable group selected from the group consisting of alkoxy and acetoxy groups directly bonded to at least one silicon atom and has one group(XI) selected from the group consisting of primary amino and secondary amino groups, wherein, said compound(j) has at least two isocyanate groups, wherein, said compound(bb) has at least 1.1 isocyanate groups and is obtained by reacting said compound (j) with a compound(k) having one to two active hydrogens being reactive with an isocyanate group in one molecule;

(2) reacting said product(V), with a compound selected from a group consisting of: a compound(c), a compound(c-1), a compound(cb), a product(C) and product(L), wherein, said compound(c) is a polyol compound, wherein, said compound(c-1) is a polythiol compound, wherein, said compound(cb) has at least one selected from the group consisting of primary amino and secondary amino groups in one molecule, wherein, said product(C) has an average molecular weight of 100 to 25000, has at least 0.2 terminal secondary amino groups in one molecule and is obtained by reacting a compound(e)